

# Thermally Stable Catalytic Combustors for Very High Altitude Airbreathing Propulsion, Phase I

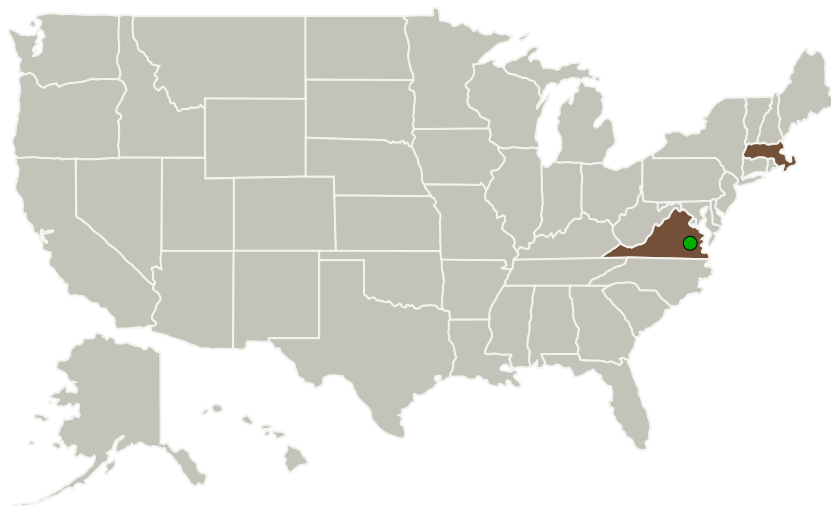
Completed Technology Project (2011 - 2011)



## Project Introduction

Aerospace vehicles operating at high altitudes have the potential to be less expensive and more versatile alternatives to space based systems for earth/space science, communications, and surveillance. However, the operational flexibility of these vehicles is limited by the performance of the propulsion system. In gas turbine systems low temperatures and pressures at the combustor inlet are of concern for combustion stability and efficiency at high altitudes. The overall objective of the proposed work is to assess the feasibility of developing a high performance airbreathing combustor for hydrogen-fueled very high altitude aircraft by promoting stable combustion using thermally stable catalytic reactor technology. Our combustor concept baselines the use of strontium-substituted hexaaluminate catalyst supports, which are resilient to temperatures greater than 1500 K. In Phase I an active catalyst that provides high reactivity with hydrogen at representative conditions will be identified through laboratory testing. An empirical model of catalyst reactivity will be developed and integrated with a reactor model to produce a conceptual design of a full scale combustor for a defined very high altitude gas turbine system. The catalytic reactor that will be developed through this effort represents a new, enabling technology that will dramatically increase the flexibility of aerospace vehicles.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

## Project Transitions

**February 2011:** Project Start

**September 2011:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138539>)

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

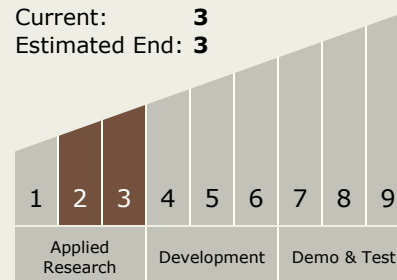
Carlos Torrez

### Principal Investigator:

James Sisco

## Technology Maturity (TRL)

Start: **2**  
Current: **3**  
Estimated End: **3**



## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.1 Integrated Systems and Ancillary Technologies

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System